REMARKS

Claims 1, 2, 8, 11-13, 15, and 19-24 were on appeal after final rejections under 35 U.S.C. §102(b) in light of various references. Claims 3-5, 7, 10, 14, 16-18 and 25-52 were considered allowable or were allowed.

The §102(b) rejections have now been procedurally reversed and a new ground of rejection has been entered by the Appeal Board for all the pending claims. Accordingly, claims 1-52 stand rejected under 35 U.S.C. §112, second paragraph. Applicants respectfully reserve the right to present further evidence and arguments regarding the previous §102(b) rejections.

The invention

The invention is a method of preparing a universal base composition (claims 1-24). The base composition is made by dispersing a pigment in a resin, the resin is soluble in both water and organic solvent. The resin includes 20 weight percent of combined hydrophobic and hydrophilic monomers, with the weight ratio of hydrophobic monomers to hydrophilic monomers of from about 1/5 to about 5.

The invention further includes a method of making an ink composition or ink dispersion including the universal base composition (claims 25-52).

Claim Rejection - 35 U.S.C. §112, second paragraph

Claims 1-52 have been rejected by the Board as being indefinite for failing to particularly point out and distinctly claim the invention. The Board opines that the claimed requirements for using a resin having a specified hydrophobic/ hydrophilic monomer ratio and total resin content of such monomers based on

the furnished definitions for hydrophobic and hydrophilic monomers are unclear and indefinite.

One of the means provided by Applicants for determining the hydrophobicity or hydrophilicity of a given monomer is solubility in water, in lower alcohol solvent, or in lower alcohol/acetate mixture solvent. The alleged indefiniteness is considered to stem from use of the word "lower" which the Board opines does not delimit the types of alcohol or alcohol/acetate mixtures, and accordingly has an "unclearly identified reach" (Decision on Appeal, page 6). Thus it is opined that the specification does not sufficiently instruct a skilled person on how to determine whether a given monomer has the desired hydrophobicity or hydrophilicity properties such that it can be used to make the resin of the claims. Applicants respectfully ask that the rejection be withdrawn.

Applicants respectfully submit that the word "lower" used to modify alcohol or acetate has a well known meaning the art. "Lower" is known to those of skill in the art as signifying an aliphatic straight chain molecule having from one (1) to about six (6) carbons. Therefore no indefiniteness is associated with the use of the word "lower" in defining a solvent containing alcohols or alcohols and acetates.

In MetaboliteLaboratories v. Laboratory Corporation of America (CAFC, June 8, 2004), the Court states the requirements of §112, second paragraph.

> "The requirement to "distinctly" claim means that the claim must have a meaning discernible to one of ordinary skill in the art when construed according to correct principles. Union Pac. Res. Co. v. Chesapeake Energy Corp., 236 F.3d 684, 692 (Fed. Cir. 2001); Rosemount, Inc. v. Beckman Instruments, Inc., 727 F.2d 1540, 1547 (Fed. Cir. 1984). Only when a claim remains insolubly ambiguous without a discernible meaning after all reasonable attempts at construction must a court declare it indefinite. Exxon Research & Eng'g Co. v. United States, 265 F.3d 1371, 1375 (Fed. Cir. 2001)."

In the instant case, the word "lower" is used to specify the nature of the alcohols and/or acetates in which the solubility of the monomers of the invention may be determined and has a meaning discernable to a person of ordinary skill in the art and is not ambiguous, thus meeting the requirements of §112.

Notably, many patents have issued which include the term "lower alcohols" in their claims and in which the term is used to denote an alcohol having 1 to about 6 carbon atoms and include alcohols such as methanol, ethanol, n-propanol, isopropanol, n-butanol, isobutanol, 2-butanol or tert-butanol. (*see*, U.S. Patent No. 7,378,461 to Haraguchi, et al. at col. 6, lines 22-31; U.S Patent No.7,161,007 to Babler et al., at claims 4, 5 and 19 and col. 3, lines 1-4; U.S. Patent No. 6,509,487 to Tatsumi et al. at claims 1-4 and col. 2, lines 40-45; U.S. Patent No. 5,719,108 to Wily et al. at claim 8 and 21 and col. 3, line 54; U.S. Patent No. 3,932,476 to Bergeron at claims 1 and col. 2, lines 46-47, and col. 4, lines 21-30). Thus, "lower alcohol" has a clear meaning in the art as an aliphatic alcohol with a chain length of from 1 to about 5/6 carbon atoms.

The same is true for "lower acetate". As can be seen in U.S. Patent No. 4,407,855 at column 2, lines 63-68, lower alcohols and lower (alkyl) acetates used as solvents for coatings generally have from 1 to about 4 carbon atoms for alcohols (propanol and butanol) and from about 4 to about 6 carbons for acetates (propyl and butyl acetate). *See also*, U.S. Patent No. 4,329,352 to Frickel et al. at col. 4, lines 17-18; U.S. Patent No. 4,189,433 to Ohnsorge et al. at col. 5, line 27-28; U.S Patent No. 4,511,657 to Hirano et al. at col. 20, lines 30-31; U.S. Publication 2007 0264367 to Kim at claims 2-3 and paragraph [0021]; and U.S. Publication 2006/217457 to Trueba et al. at claim 34 and paragraph [0021].

Further, the definition of "lower" alcohols and acetates as solvents used in printing inks is well known and indeed listed in ***The Printing Ink Manual***, 5th edition, 1993 (attached as Appendix 1). Solvents are defined to include

hydrocarbon solvents, alcohols, glycols, ketones, and esters (*see* pages 250-261). The alcohols listed are all "lower" alcohols in that they include 1 to 6 carbon atoms. Specifically listed are ethanol (2 carbon atoms), n-propyl alcohol (3 carbon atoms), isopropanol (3 carbon atoms), n-butyl alcohol (4 carbon atoms), and alicyclic alcohols (6 carbon atoms) (*see* pages 255-257). Thus, those of ordinary skill in the art know that alcohols used as solvents are "lower" alcohols. The esters listed are all "lower" acetates in that they include 4 to 7 carbon atoms. Specifically listed are ethyl acetate (4 carbon atoms), isopropyl acetate (5 carbon atoms), n-butyl acetate (6 carbon atoms), and n-propyl acetate (5 carbon atoms)(*see* pages 260-261). Thus, those of ordinary skill in the art know that acetates used as solvents are "lower" acetates.

Based on the above references, it is clear that a practitioner would have no trouble determining what is meant by "lower alcohol" and "lower acetate" when formulating a solvent to determine the hydrophobicity or hydrophilicity of a given monomer. Therefore the scope of the resin of the claims as made with hydrophobic and hydrophilic monomers is clear and defined.

In this regard, the Metabolite teaching is amplified in the MPEP in section 2173.02,

> "The examiner's focus during examination of claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph, is whether the claim meets the threshold requirements of clarity and precision, ... The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of: (A) The content of the particular application disclosure; (B) The teachings of the prior art; and (C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. In reviewing a claim for compliance with 35 U.S.C. 112, second paragraph, the examiner must consider the claim as a whole to determine whether the claim apprises one of ordinary skill

> in the art of its scope and, therefore, serves the notice function required by 35 U.S.C. 112, second paragraph, by providing clear warning to others as to what constitutes infringement of the patent." "Only when a claim remains insolubly ambiguous without a discernible meaning after all reasonable attempts at construction must a court declare it indefinite."

The guidance provided by the MPEP for a §112, second paragraph analysis instructs that determining whether a claim meets threshold requirements of clarity and precision should be done using all available resources, namely the context of the disclosure, teachings of the art, and the understanding of a skilled practitioner. A rejection denying meaning to the claim should only be made if the claim, after this analysis, remains "insolubly ambiguous without a discernable meaning".

Keeping in mind that the subject matter is a resin made using hydrophilic and hydrophobic monomers, that the claims meet the requirements of §112, second paragraph rejection is further demonstrated by the guidance provided by the specification on various specific functional groups and monomers that serve the purpose, so to speak, "ready-made". As discussed above these examples are not offered as limitations, but as examples on how one skilled in the art would understand how to characterize the monomers used as described in the claimed invention.

As shown above, the term "lower" used to modify alcohol and acetate is not ambiguous nor lacking discernable meaning when considered in light of the teaching of the art and the understanding of a skilled practitioner. Not only is the term unambiguous, but based on teachings that "lower" is known to indicate an alcohol of about 1 to about 6 carbons and an acetate of about 4 to about 6 carbons in the art of solvents for pigment and coating compositions, this term clearly sets forth the claimed subject matter as required by §112, second paragraph.

Conclusion

Based on the foregoing it is respectfully submitted that the 35 U.S.C. §112 rejection should be withdrawn. Applicants believe that the foregoing constitutes a complete and bona fide response to the Decision on Appeal dated March 31, 2008. It is respectfully requested that prosecution be reopened for this application by the submission of new evidence relating to the claims rejected. The new evidence is included herein in the Remarks section and attached hereto as Appendix 1.

Should any issue(s) of a minor nature remain, the Examiner is invited to telephone the undersigned at telephone number (917) 741-0802 so that the issue(s) may be promptly resolved. Applicants respectfully solicit reconsideration and eventual allowance of the subject application.

Respectfully submitted,

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FIFTH EDITION

THE PRINTING INK MANUAL

EDITED BY R. H. LEACH

AND R. J. PIERCE

BLUEPRINT
An Imprint of Glasgow & Hall

APPENDIX I

Published by Blueprint, an imprint of Chapman & Hall, 2–6 Boundary Row, London SE1 8HN, UK

Chapman & Hall, 2–6 Boundary Row, London SE1 8HN, UK

Blackie Academic & Professional, Wester Cleddens Road, Bishopbriggs, Glasgow G64 2NZ, UK

Chapman & Hall Inc., One Penn Plaza, New York NY10119, USA

Chapman & Hall Japan, Thomson Publishing Japan, Hirakawacho Nemoto Building, 6F, 1-7-11 Hirakawa-cho, Chiyoda-ku, Tokyo 102, Japan

Chapman & Hall Australia, Thomas Nelson Australia, 102 Dodds Street, South Melbourne, Victoria 3205, Australia

Chapman & Hall India, R. Seshadri, 32 Second Main Road, CIT East, Madras 600 035, India

First edition 1961
Reprinted 1963 (with revisions)
Second edition 1969
Third edition 1979
Reprinted 1984
Fourth edition 1988
Reprinted 1988, 1989, 1991
Fifth edition 1993

Typeset in Meridien 10/11 by Falcon Graphic Art, Wallington, Surrey

Printed in Great Britain by TJ Press (Padstow) Ltd, Padstow, Cornwall

ISBN 0 948905 81 6

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication data available

Printed on permanent acid-free text paper, manufactured in accordance with the proposed ANSI/NISO Z 39.48-1992

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Prefa
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resistance. They are used in gravure and screen inks, as well as forming excellent media for the dispersion of pigmented chips by two-roll milling or extrusion.

Sodium carboxymethyl cellulose (CMC)

A white granular powder which is readily soluble in water or aqueous mixture of the lower alcohols and ketones. Addition of acidic materials causes precipitation. It is compatible with gum arabic, polyvinyl alcohol, starch, hydroxyethyl cellulose and certain urea formaldehyde resins. CMC can be plasticized with the usual water-soluble plasticizers, such as glycerine, glycols, ethanolamines, etc. In the food industry 'cellulose gum' is used to designate purified CMC for use in foods.

Commercially it is manufactured by treating alkali cellulose with sodium monochloracetate. The amount of sodium monochloracetate is controlled such that 0.3–1.2 (usually 0.7) sodium carboxymethyl groups are introduced per unit of β-glucose anhydride. Thus, each unit of product will usually have 2.3 hydroxyl groups. Several viscosity grades are available.

Chemical constitution

The basic formation reaction is:

$$RONa + ClCH_2COONa \rightarrow ROCH_2COONa + NaCl$$

Sodium carboxymethyl derivative

where R represents the cellulose radical.

Mainly used as a protective colloid and thickening agent for water-based inks and to 'gum up' lithographic plates.

It is also used as a sealer to control the porosity of paper so that it gives more gloss and consumes less ink.

Section 5: Solvents

The term solvent is widely applicable to a great number of solid, liquid and gaseous substances. The concepts of solvent and solute are interchangeable, so it is necessary to refer to a definition of solution when stating what a solvent is. A solution is a stable separation of molecules of one substance by admixture with molecules of one or more other substances. Inkmakers frequently make solutions by mixing substances (using heat if necessary) which may not spontaneously intermix on the molecular scale, but which subsequently remain in solution once mixed. Substances which spontaneously separate are non-solvents for each other: physical interactions between molecules determine the readiness with which substances intermix under given conditions of concentration and temperature.

Solvent power is the most important factor in considering the usefulness of a solvent. Solvent powder is not a general, abstract property, but a specific one relative to what is to be dissolved. The often met require-

ments that some solutions must have a high film-former conten relatively low viscosity, while solvent must separate entirely fro printed film on evaporation drying, lead back to consideration degree of likeness of film-former and solvent. In polymer solutic high concentration, liquids which possess the highest solvent powe solutions with the lowest viscosity, and this property can be use yardstick in assessing the power of a particular solvent relative particular polymer. Conversely in solutions of low concentratio solvent producing the greatest intrinsic viscosity has the highest s power for the polymer.

Solvents which have a high hydroxyl content are strongly pol have a high dielectric constant, whereas hydrocarbon and other solve have a low dielectric constant, being non-polar.

Because the equilibrium of physical interactions between molec in a mixture of solvents is a complex mean of the compon interactions, it often happens that two or more non-solvents fc polymer can be mixed in proportions such that the blend dissolves polymer. This is the phenomenon of cosolvency. When a non-solv for the principal resin is added to an ink it is conventionally referre as a diluent or reducer. In fact diluents sometimes form a cosolv blend with the ink vehicle solvents; a small change in proportions r result in greater solvent power of the blend for the film-former, large additions of diluent cause precipitation in extreme cases converse of the cosolvency effect is possible. Examples exist where solvents for a polymer form a non-solvent blend for the same poly because a critical solvent–solvent interaction is far stronger than same solvent–polymer interaction.

The rate of evaporation is important after solvent power when selec solvents for inks. Slow solvents (those of low volatility) are necessary press-stability of letterpress and lithographic processes. Controlled eva ration rates are needed in inks that dry by evaporation. The evapora rates of solvents in a blend vary with the components, the concentrat and temperature. Physical interaction between species of molecule a both the effective and the relative volatility of components in a bl Volatility at a given temperature is largely determined by vapour pres and heat of vaporization.

A solvent mixture of definite composition, having a constant bo temperature (which may be higher or lower than that of all compon in the mixture) is called an azeotrope. The term 'balance' is app solvent blends having a composition that remains constant as th evaporates. A solvent blend that is balanced for evaporation dr room temperature usually differs from one that is balanced for assisted drying (around 60°C), and both blends normally differ from azeotrope if one exists. It is possible for mixtures to have vapour pr such that the blend has a flash point lower than any of its consti Other properties that have to be seriously considered when sele solvent for use in printing inks include residual odour, flammab toxicity, purity and colour. The chemical constitution of pure solve of less importance than that of drying oils or resins (except in cons ation of solvent power), since solvents do not usually take pa

chemical reactions in ink vehicle manufacture. However, the presence or absence of water is significant in certain cases.

The properties of some solvents are tabulated on page 304. They are arranged in the following chemical groups for convenience: (A) hydrocarbon (aliphatic; naphthenic; aromatic); (B) monohydric alcohol (aliphatic; alicyclic); (C) glycol; (D) glycol ether; (E) ketone; (F) ester.

The chemical formula for each solvent is given (where possible), with commercial preparation, boiling range, relative density, flash point (closed cup, unless otherwise stated), colour, the main type of resin which it usefully dissolves and finally miscellaneous properties and applications.

Legislation requires manufacturers to make available to all users details of hazards and precautions for the handling of their products, including solvents. Manufacturers have co-operated in a sensible manner and heed should be taken of their recommendations for any precautions needed. All solvents used in printing inks can be used with safety, if the precautions prescribed by factory or industrial health and safety committees are taken.

It is the user's responsibility to see that care is taken in marking and handling of materials, that sufficient ventilation is installed and where necessary, protective clothing is provided and worn. Any risks that exist must be minimized, as nearly all solvents have an effect on the human body, serious effects being dependent on the amount of solvent and the time of exposure to it. Large doses in a short time cause acute poisoning usually by affecting the nervous system. Smaller dosage over a long period of time can cause sensitization or chronic damage to organs.

Exposure to solvents is influenced by volatility of solvents which depends upon concentration, vapour pressure and temperature, or by physical contact with the solvent itself by immersion or ingestion.

The human body reacts in many ways. Swallowing solvent or inhaling concentrated vapour can result in poisoning and causes vomiting, hallucinations, unconsciousness or death. Immersion of the hands in solvents is undesirable as toxic action may become possible by transfer to the mouth or absorption through the skin into the blood stream. Skin complaints can be caused by solvents, due to personal allergy to a particular solvent or by a degreasing of the skin which leads to irritation or infection. Barrier creams and the use of lanolin or hand cream after washing are a preventative measure in that they restore the grease level that protects the skin from bacterial attack.

Many technical grades of solvent are not pure chemicals, but contain isomers and sometimes homologues, which it may be uneconomic, and even undesirable to remove. This results in boiling ranges instead of boiling points and applies particularly to hydrocarbon solvents. In the aromatic series, terms such as 'toluol' were used to describe the less pure grades of toluene, and British Standards exist, such as BS 805:1977 for toluenes, defining three different grades. The chemical names benzene, toluene and xylene are now standard for referring to aromatic hydrocarbons. Three grades of xylene are specified in BS 458: 1977.

s mineral oil.
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Many distillates are now
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ravure inks for which
ust be taken to ensure

solvent release to prevent sticking and blocking of the printed reel.

It is a solvent for rubber, chlorinated rubber, melamine, urea formaldehyde, phenolics, ethyl cellulose, resinates, ester gum, polyvinylacetate and polystyrene resins.

Xylene (xylol); CAS No. 1330-20-7

Slower-evaporating solvent than toluene consisting mainly of mixtures of three isomers of dimethyl benzene. Also derived from coal tar or petroleum, its flash point is 74°F but its slow evaporation rate (equal to half that of toluene) limits it to use in gravure proofing and sheet-fed gravure inks. However, its excellent solvency power for many resins makes it a useful solvent in the removal of dried ink films.

Its solvency is similar to toluene, except that it is a poor solvent for polyvinyl acetate, but it will penetrate PVC and treated polythene.

High-boiling aromatic solvents

Mostly single-ring aromatic structures with side chains or alkyl groups attached, containing small amounts of paraffins and naphthenes. A number of proprietary brands are available, with differing boiling ranges and flash points. They are normally water-white or slightly yellow with a sweet odour characteristic of aromatic solvents.

They are used mainly in roller coating finishes and screen inks. They have KB values from 60 to 100 and are solvents for common resins such as ester gum, alkyds, maleics, modified phenolics, urea and melamine formaldehyde, chlorinated rubber and polystyrene.

4.23 ALCOHOLS

Methylated spirits (Ethanol)

CAS No. 64-17-5

Ethyl alcohol (ethanol) is not used as pure anhydrous alcohol in commercial manufacture of printing inks. Industrial methylated spirits is essentially ethanol C_2H_5OH and water, to which a denaturant such as 4% of methyl alcohol has been added.

Two grades of industrial methylated spirits (IMS) are used extensively in gravure and flexographic inks. They are 64 op and 74 op (op denotes over-proof). Proof spirit contains 57.1% alcohol by volume (49.3% by weight) and has a relative density of 0.92 at 15.6°C (60°F).

Industrial methylated spirits 64 op (density 0.821) contains 9.7% by weight of water, while 74 op IMS (density 0.797) contains 1.4% water.

Industrial methylated spirits as specified in BS 3591: 1963 consists of a mixture of 95 volumes of the ethanol/water mixture with 5 volumes of acetone-free wood naphtha approved by the Commissioners of Customs and Excise as a denaturant. The mixture must conform to the Methylated Spirits Regulations 1962.

Normal propanol (*n*-propyl alcohol)

CAS No. 71-23-8

A very pure solvent, C_3H_7OH used because it has a higher boiling point than meths or isopropanol. It is miscible with water in all proportions and with many other solvents. It has a characteristic sweet odour.

n-propanol is used in flexographic and gravure inks and overprint lacquers.

Resins that are soluble in methylated spirits are soluble in *n*-propanol, also it is a partial to good solvent for polyamides.

Isopropanol (isopropyl alcohol or secondary propyl alcohol)

CAS No. 67-63-6

A colourless alcohol C_3H_7OH with chemical and solvent properties similar to ethyl alcohol. It is supplied industrially in two grades, sometimes called the isopropyl solvents. As a first grade it contains 99.7% alcohol b.p. 82.3°C (IPS 1), the second is a water azeotrope containing a minimum of 87% isopropanol b.p. 80.3°C (IPS2). It is miscible with water, also it is used as a latent solvent in conjunction with ketones and esters in nitrocellulose lacquers, aiding their solvency and tolerance of hydrocarbon diluents.

It is a solvent for many natural and synthetic resins including ester gum, rosin, shellac, ethyl cellulose, spirit soluble phenolics, amino resins, PVAC and PVB. Like *n*-propanol it is only a partial solvent for polyamide resins, but exhibits cosolvency for polyamides in conjunction with hydrocarbon diluents.

Normal butanol (*n*-butyl alcohol)

CAS No. 71-36-3

A slowly evaporating alcohol of high purity consisting essentially of butan-1-ol, $CH_3 - CH_2 - CH_2 - CH_2 - OH$, miscible with most solvents, partially miscible with water and possessing excellent solvency power.

Used in metal coatings, some gravure and screen formulations but has considerably more residual odour than *n*-propanol or isopropanol, which precludes it from use in food wrapper inks. Used in conjunction with kauri gum to produce the 5% solution for measuring KB value. Widely used as a latent solvent in nitrocellulose and acrylic-based lacquers. Among other resins that are soluble in butanol are alkyds, urea and melamine formaldehyde, shellac, ester gum, PVAC and metallic resinates. Basic dyestuffs, oils, fats and waxes are also soluble in butanol.

Specification requirements of *n*-butanol are described in BS 508:1966.

Alicyclic alcohols

Cyclohexanol; CAS No. 108-93-0

An oily liquid with a strong but not objectionable odour. It has a fairly high flash point and boiling range. A solvent for cellulose ethers, ester gum, shellac, low viscosity silicones and polyvinyl chloride. It has a fairly limited use in screen inks. It is miscible with oils and hydrocarbon solvents.

Methyl cyclohexanol; CAS No. 583-59-5

An oily liquid with an odour similar to cyclohexanol. Its solvency power is less than that of cyclohexanol for the resins named above and its uses in ink manufacture are similarly limited.

4.24 GLYCOLS

Monoethylene glycol

CAS No. 107-21-1

Ethylene glycol is a colourless odourless somewhat viscous solvent which is very hygroscopic, miscible with water, alcohol and some ketone solvents. It is used in moisture-set inks and water-reducible letterpress inks. The relatively rapid evaporation rate leads to poor press stability.

Ethylene glycol is a solvent for gelatine, dextrin zein and maleic or fumaric resins of high acid value.

Monopropylene glycol

CAS No. 57-55-6

A colourless odourless solvent similar to ethylene glycol in most respects, but is considered as absolutely safe for use in foodstuffs and medicines. It is recommended for use in food packaging inks and formulations for marking foodstuffs.

Its solubility is similar to ethylene glycol though it is slightly more organophilic.

Hexylene glycol

A colourless liquid with no odour or taste used in the soft drink confectionery and cosmetic industries. It is slightly slower in evaporation rate than ethylene glycol, is miscible with vegetable oils and many organic solvents. Its use is somewhat limited by its high cost. The purified grade can be used in moisture-set inks for food wrappers. Its solubility is similar to ethylene glycol though it is more organophilic.

Diethylene glycol

CAS No. 111-46-6

Colourless liquid more viscous and hygroscopic than ethylene glycol.

water but miscible with most solvents and oils. Used in gravure and screen inks, having an evaporation rate of only about one-eighth that of acetone. Solvent for nitrocellulose, ethyl cellulose, CAB, PVC, PVAC, vinyl copolymers, acrylics, chlorinated rubber, polyurethane, phenolic and epoxy resins.

Cyclohexanone (sextone)

CAS No. 108-94-1

Colourless liquid having a strong characteristic odour. Only slightly soluble in water, but a powerful solvent for oils and fats, miscible with hydrocarbons. It is used in special screen inks. A good solvent for most polymers, it will penetrate polythene and soften perspex.

Methyl cyclohexanone (sextone B)

This solvent resembles cyclohexanone but is slightly slower evaporating; colourless to pale yellow, with a strong odour described as similar to peppermint and acetone. It is used in special screen inks and lacquers. Its solvency action is similar to cyclohexanone.

Isophorone

Excellent ketonic solvent in the high boiling range, colourless but with a strong odour due to impurities present, only slightly soluble in water but miscible with most solvents. Solvent for oils and fats; used in metal-decorating coatings and screen inks. Regarded as a powerful solvent for nitrocellulose and vinyl resins, also for many other natural or synthetic resins.

Diacetone alcohol

CAS No. 123-42-2

Clear colourless liquid which yellows on standing. It is a ketonic alcohol, normally classified with the ketones. It has a faint odour and is miscible with water, many solvents and some oils including castor oil. It is not compatible with high-boiling aliphatic hydrocarbons. Used mainly in flexographic inks. Because it is slow evaporating it assists 'flow out', giving glossy films, especially with nitrocellulose. Diacetone alcohol is also used in some roller cleaner formulations. It is a good solvent for cellulose acetate and nitrocellulose, PVAC, shellac, zein and basic dyestuffs.

4.26 ESTERS (Acetates)

Ethyl acetate

CAS No. 141-78-6

One of the best low boiling solvents for nitrocellulose, water-white with

strong fruity odour. Partially miscible with water (8% w/w at 20 but miscible with castor and linseed oil, and hydrocarbon solvents. solvent power is increased by adding a small quantity of alcol Extensively used in flexographic and photogravure inks and in lacq formulations as a fast-drying solvent. Its evaporation rate is sligl below that of acetone at room temperature. Solvent for NC, EC, C. PVAC, polystyrene, ester gum and maleics; ethyl acetate penetrate polythene, perspex and PVC.

Isopropyl acetate

CAS No. 108-21-4

Properties very similar to ethyl acetate but its relative evaporation rate a room temperature is about half and its water tolerance is less.

N-butyl acetate

CAS No. 123-86-4

Colourless liquid with fruity acetate odour. Not miscible with water but miscible with oils and many solvents including hydrocarbons. Use in small amounts in flexographic inks, gravure inks and overprin lacquers as well as some screen and metal-decorating inks. Because o its excellent solvent properties and slow solvent release it gives goo gloss and reduced solution viscosities. The evaporation rate is abou one-sixth that of ethyl acetate. Good solvent for nitrocellulose, hydro carbon resins, rosin, ester gum, chlorinated rubber, vinyls, polystyren and acrylates. In the presence of 20% butanol, *n*-butyl acetate wi dissolve shellac and some alkyds.

N-propyl acetate

CAS No. 109-60-4

Water-white solvent with fruity odour. Gained recognition, particular with the demise of cellosolve, as a retarder with good solvency and n residual odour. Now an important liquid ink solvent.

Section 6: Plasticizers

The main function of a plasticizer in an ink film is to make the dried prin more flexible and pliable. Plasticizers need to be essentially non-vola in their final ink format. Inks that dry by evaporation, especially nonporous surfaces, tend to be brittle, and flexing can crack the film an rupture the adhesion. Plasticizers help to supply elasticity to an ink film and allow it to bend or crease without failing. They do this by acting a solvents for the film-former polymer molecules, maintaining the exac degree of mechanical freedom required.